



# Towards Declarative 3D in Web Architecture

**Jean Le Feuvre**

[jean.lefeuvre@telecom-paristech.fr](mailto:jean.lefeuvre@telecom-paristech.fr)





## A bit of (GL) Context

### ■ R&D @ GPAC

- Declarative 3D (MPEG-4 BiFS & X3D)
- 2D+3D integration
- 3D Displays

### ■ Requirements focus

- Attractivity
- Efficiency
- UI 2.0





# Towards Declarative 3D in Web Architecture

## Dec3D and WebGL Toolkits

**Jean Le Feuvre**

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# Be Careful with Dec3D Feature Set !

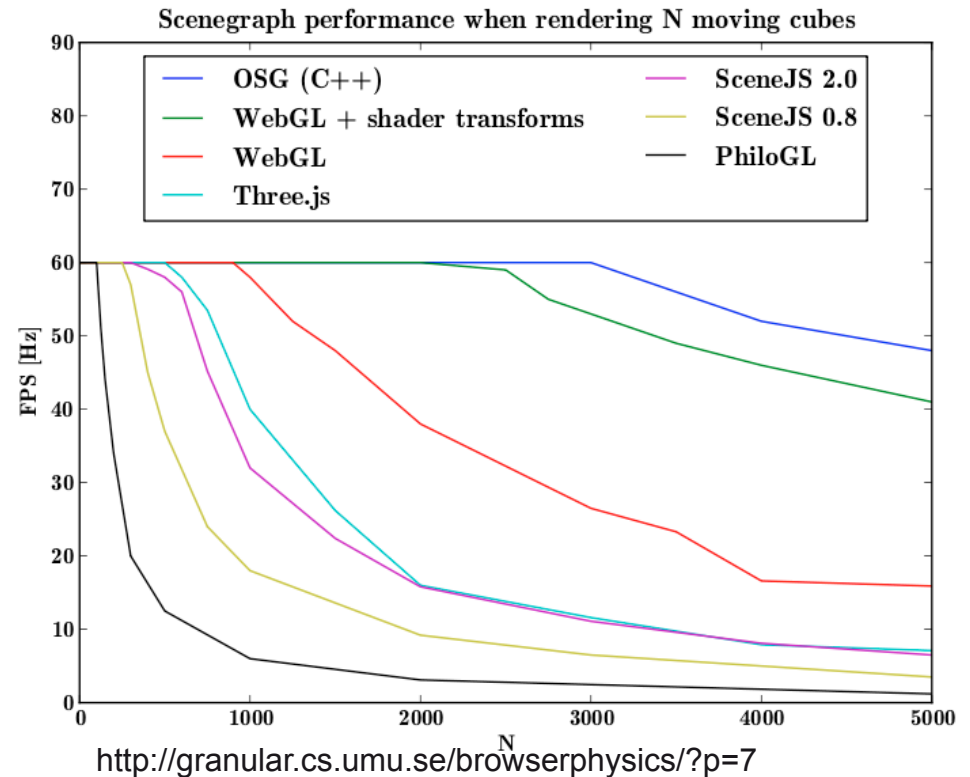
## ■ Native Scene tree “frozen”

- Unneeded features
  - Slow traversing/rendering
- Missing elements
  - Limits complexity of 100% declarative scenes

=> Make dev move to JS-based design

## ■ JS Scene Tree

- Modular but slower



*REQ1: DEC3D scene graph shall be **modular***

*REQ2: DEC3D scene graph shall be **extensible***



# Models

## ■ Loading

- JSON, XML
  - Download time (low- or un- compressed)
  - Parsing time
- Binary
  - ArrayBuffers still slow

## ■ Rendering

- Done in WebGL
  - Near Native Speed
- Through VertexBufferObject
  - VBO ID assigned in WebGL code

*REQ3: DEC3D shall support native loading of models & 3D assets*

*REQ4: Loaded models shall be reusable in WebGL*



# Declarative & Imperative

- **Allow dev to change native algorithm**
  - E.g. use Picking and rewrite Collision
- **Make Dec3D “future proof”**
  - Provide WebGL fallbacks
    - e.g. modify render/pick routines
  - Avoids dev to move to 100% JS

*REQ5: support alternate implementation of functionalities in WebGL*

*REQ6: local override of native implementation with WebGL*



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**Filling the gap between 2D and 3D**

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# Dec3D and HTML Layout

- **Mixing flow-layout & absolute coordinate system**
  - cf HTML & SVG
  - Definition of 3D regions, clipping or not
- **Dec3D without HTML**
  - Fullscreen applications

*REQ7: DEC3D shall support drawing within the HTML flow layout*

*REQ8: DEC3D shall support using the entire HTML window as its 3D rendering area*





# Interactivity

- **Simplify the author work**
  - Unify event system with DOM Events
  - Give access to world & local coordinates
- **But not the possibilities**
  - Allow for complex event info gathering
    - Hit point coords, texCoords and normal
  - But only if needed (modular design)

*REQ9: DEC3D shall use the DOM event model (unification with SVG or HTML).*

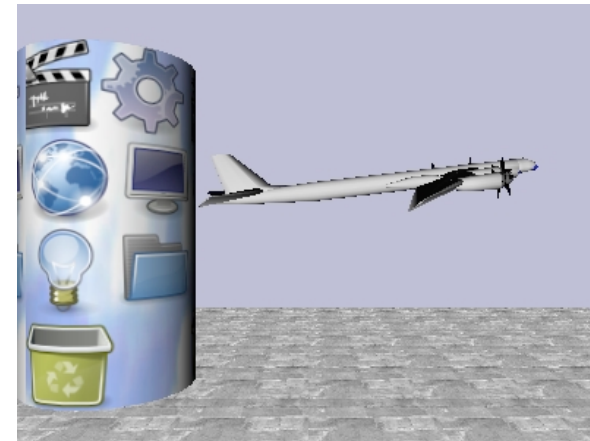
*REQ10: DEC3D shall use a coordinate system for events aligned with DOM Event*

*REQ11: DEC3D shall have support for hit point coordinate, texture coordinate and normal value*



# Mixing 2D and 3D

- **Compelling use case**
  - 2D pages on 3D walls
  - 3D worlds / objects in 2D web
- **Available Tools**
  - Canvas 2D and 3D
  - Texture transfer costly high
  - Lack of interoperability
- **More complex scenarios**
  - Speedup rendering through offscreen areas
  - Applying Filter Effects



*REQ12: DEC3D shall have support for using 2D or 3D DOM content as textures/patterns,*

*REQ13: DEC3D shall have support for offscreen rendering of part of the DOM tree (inc. DOM Events)*



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## Next Generation 3D

**Jean Le Feuvre**

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# Stereo and Multiview Displays

- **Beyond video or images**
- **Depth effects in 2D content**
  - Keep it simple
  - no (full) 3D context required
- **Models & Virtual Worlds**
  - Camera Displacement
    - Circular / Linear / OffAxis
  - Camera vergence
    - 0-disparity plane



*REQ14: DEC3D shall have support for 3D (auto-)stereo displays*

*REQ15: DEC3D shall support depth or z on 2D HTML or SVG area.*

*REQ18: DEC3D shall be able to define the camera parameters used during multi-view generation*



# Multiview displays

## ■ Future 3D screens

- Large number of views (>20)
- Costly to render frame/frame
  - Usage of depth/disparity maps
  - Cf 3DVC@MPEG

## ■ DIBR & Dec3D

- Support of depth maps (jpeg, png,...)
- Generation of Synthetic Depth Maps
  - SVG or Canvas or ...
  - Advanced, dynamic 3D effects



*REQ16: DEC3D shall have support for Depth-Image Based Representation*

*REQ17: DEC3D shall be able to generate synthetic depth maps*

# Dec3D vs X3D vs BIFS vs Collada vs WebGL vs ...

**Please! Please!**

**This is supposed to be a happy occasion!**

**Let's not bicker and argue about who killed who.**

*Monty Python and the Holy Grail*



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Questions ?

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